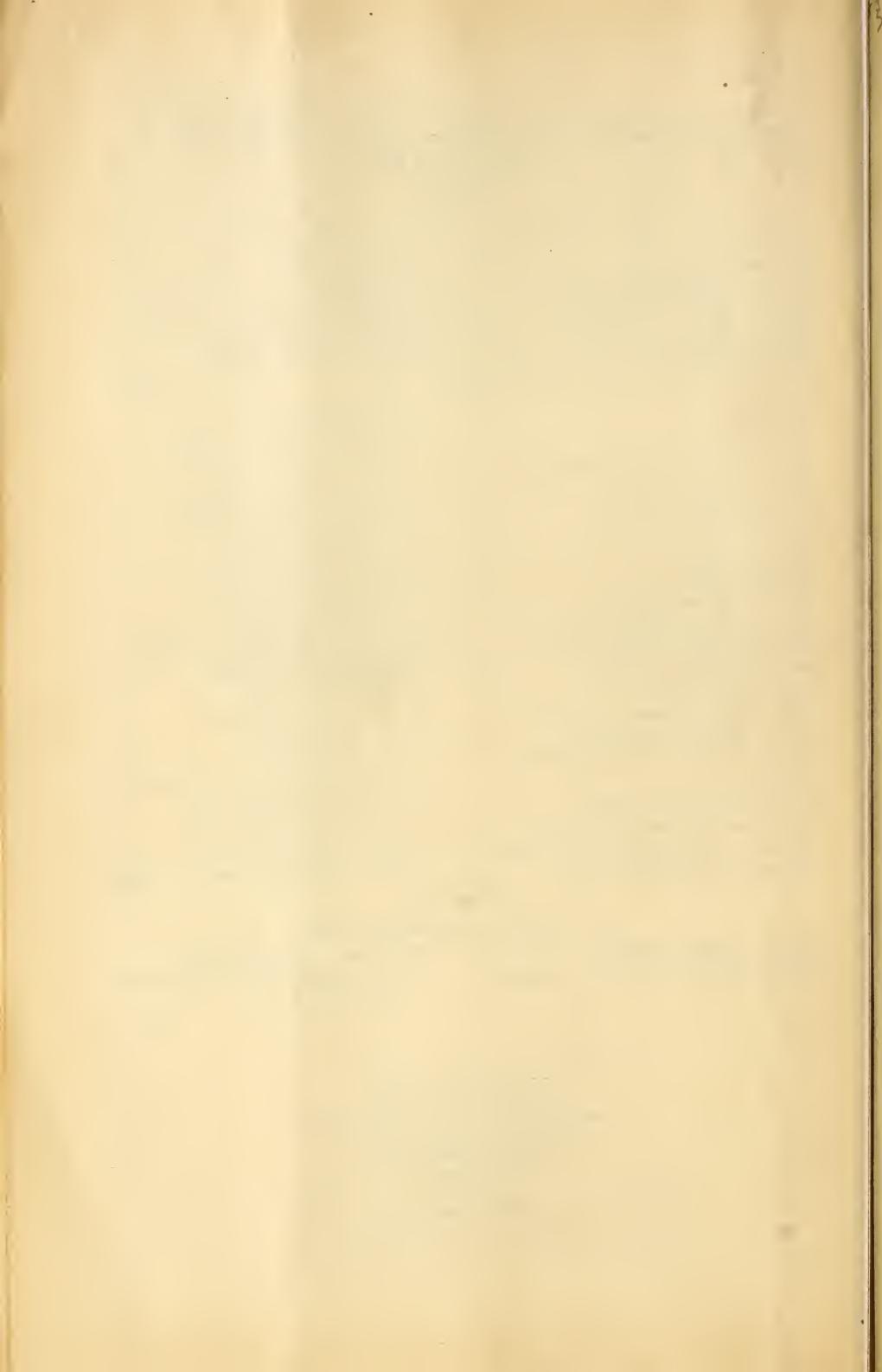


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UNITED STATES DEPARTMENT OF AGRICULTURE

In Cooperation with the New York (Cornell) Agricultural Experiment Station

DEPARTMENT CIRCULAR 353

Washington, D. C.

August, 1925

IMPROVED OAT VARIETIES FOR NEW YORK AND ADJACENT STATES

H. H. LOVE

Professor of Plant Breeding, New York (Cornell) Agricultural Experiment Station, and Collaborator
of the Office of Cereal Investigations

T. R. STANTON

Agronomist in Charge of Oat Investigations, Office of Cereal Investigations, and

W. T. CRAIG

Agent, Office of Cereal Investigations, Bureau of Plant Industry

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Among the older and earlier settled Eastern States New York ranks second in oat production. Over a million acres, or about two-fifths of the total cereal acreage, are devoted annually to the crop in the State. The average acre yield for the 16-year period from 1908 to 1923, inclusive, was 31.9 bushels. This is approximately the same as the average yield for the entire country during that period. This relatively low yield is due in part to the use of poorly adapted and low-yielding varieties.

The crop, as in other large oat-producing States, particularly those of the Corn Belt, is not a very profitable one in cash returns. However, oats fit so well into predominating rotations and provide such a valuable feed for work, breeding, and young stock that the crop is assured an important place in the agriculture of New York and similar States.

Recognizing these facts, it is desirable that better adapted and higher yielding varieties of oats should be developed and made available to the grower. With this end in view, extensive breeding

investigations with oats, conducted cooperatively by the Office of Cereal Investigations of the Bureau of Plant Industry, United States Department of Agriculture, and the department of plant breeding of Cornell University have been in progress since 1907. Some of the practical results of this work have been the development of the improved strains of oats described in this circular.

EXPERIMENTAL METHODS

EXPERIMENTS AT ITHACA

The methods used in determining the yielding power of the various selections may be of interest.¹ The work was begun by making head selections from a number of varieties of proved ability. Heads also were selected from a variety found in Jefferson County, N. Y., which had been grown on the same farm for about 20 years and was known locally as American Beauty.

Seed from the heads thus selected was sown in head rows the first year, with the same quantity of seed used for each row. Every tenth row was sown as a check with seed of the variety from which the selections were made; that is, as a check for the selections made from the Lincoln variety unselected mass seed of Lincoln was used. The selections then were compared with the varieties from which they were made, and the better ones were saved for sowing the following year. This was done in all cases except for the selections made in Jefferson County. In handling these the earlier experiments were conducted on the farm where the original selections were made until the different strains were brought into the regular 10-row nursery test at Ithaca.

The second-year seed of these selections was sown in triplicate rows 15 feet long and 1 foot apart. The plan in arranging the plantings was to sow single rows of all the sorts and then repeat the entire series twice. Two checks were used this second year. The variety from which the selections were made was sown in every tenth row, beginning with row 5. The regular check alternated with the parent-variety check and was sown in every tenth row, beginning with row 10. The yields of the rows were determined and the best ones selected for continuation the following year. The fact that two checks were grown made it easy to select the most promising strains.

The third and following years each strain was sown in a single 15-foot row, and after all sorts were sown once the entire series was replicated nine times, giving 10 rows of each strain on which to base yield determinations. A standard check was sown every tenth row. The poorer strains were eliminated each year and only the better ones continued.

Beginning with 1921 a further test of yield was made for a few of the best selected strains and some of the more important commer-

¹ The methods here described differ in some respects from those now in use. For a more complete discussion of experimental methods employed by the department of plant breeding of Cornell University, see the following publications:

Love, H. H., and W. T. Craig. Small grain investigations. *In Jour. Heredity*, vol. 9, pp. 67-76, illus. 1918.

Methods used and results obtained in cereal investigations at the Cornell station. *In Jour. Amer. Soc. Agron.*, vol. 10, pp. 145-157, illus. 1918.

Methods now in use in cereal breeding and testing at the Cornell Agricultural Experiment Station. *In Jour. Amer. Soc. Agron.*, vol. 16, pp. 109-127, illus. 1924.

cial varieties. This is known as the advanced test. It consists of three 15-foot rows² of each sort sown together, with a check block of three rows every third block. Three rows of the check variety were sown, then three rows of variety A, three of variety B, and then three of the check, three of variety C, and so on. After one series of all the strains had been sown the entire series was replicated nine times, giving 10 blocks of three rows each. Each row was harvested separately and the yield of grain also determined separately. The yield was based on the results of all the rows, as varietal competition did not seem to have any effect on the yield of border rows. These methods of experiment have served to indicate the most promising varieties and strains. The extensive oat nursery at Ithaca, N. Y., is shown in Figure 1.

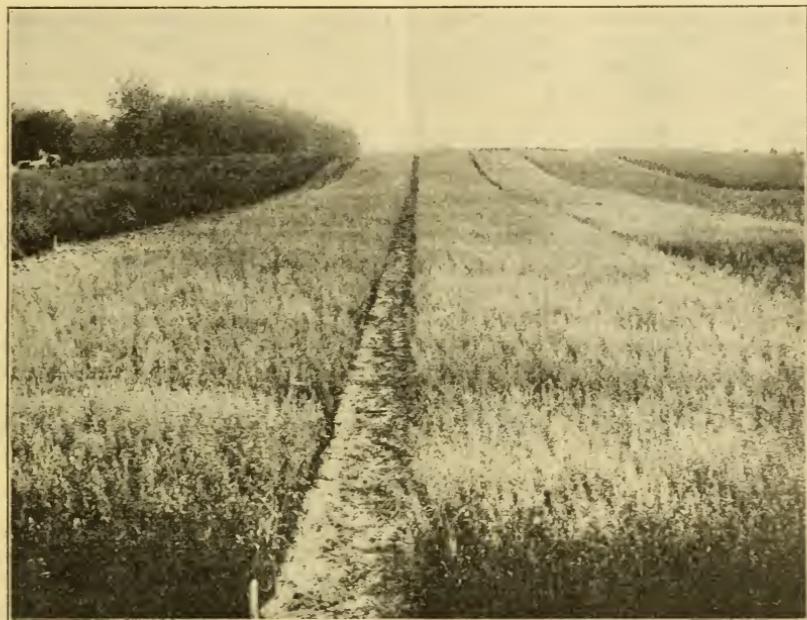


FIG. 1.—General view of the oat nursery at the New York (Cornell) Agricultural Experiment Station, Ithaca, N. Y.

Drill plats also were sown to determine the behavior of the oats under field conditions. These plats were carefully rogued, and from them was obtained seed for the multiplication plats. The multiplication plats also were rogued and provided the seed supplied to the farmers for testing and growing. The farmers serve as the distributing agency, as the department of plant breeding reserves only enough seed to supply a few growers with pure seed for their multiplication plats.

EXPERIMENTS ON NEW YORK FARMS

In the preliminary experiments on farms in the State, begun in 1918, duplicate drill plats were used. When the grain was ripe equal

² The first year this consisted of two 15-foot rows instead of three.

areas throughout the plats were harvested and their yield determined. In these earlier experiments were included several pure-line selections and commercial and locally grown varieties as well as a few early varieties. In 1921 the trials were limited to certain specific sorts and types, and a more exact method of comparison was adopted.

In these later experiments usually from 12 to 14 strains were tested, and the plats were sown by hand. The several varieties were sown in parallel blocks of three 15-foot rows each at the rate of 10 pecks to the acre. After all the strains were used once the series was repeated four times in the same order. The entire plats were harvested by hand and threshed at Ithaca. The average yield of the five blocks of each sort was taken as the yield of the variety in each experiment.

Such experiments have been conducted in Allegany, Delaware, Dutchess, Genesee, Jefferson, Lewis, Madison, Ontario, Oswego, Schoharie, and St. Lawrence Counties, N. Y. The results of these experiments from 1921 to 1924, inclusive, are presented later in this circular.

VARIETIES DEVELOPED

In the course of these cooperative experiments hundreds of strains of oats have been isolated and tested, but only the few which have continued to show outstanding high-yielding power under the rigid methods of experiment previously described in this circular have been distributed to farmers for trial. The strains so far distributed were not named until their yielding ability on New York farms had been determined. Those which have become of some commercial importance are the Comewell, Empire, Ithacan, Standwell, Upright, and Cornellian. The histories and descriptions of these improved strains follow.

COMEWELL

History.—Comewell (C. I. No. 1317)³ is a pure-line selection from the old commercial variety known as Welcome. The original selection was made by J. B. Norton, formerly of the United States Department of Agriculture,⁴ from a field plat of Weome grown in 1904 at Shirley, Ill., in cooperation with the Funk Bros. Seed Co. It was designated as pedigree No. 123-5 and has been grown at the New York (Cornell) Agricultural Experiment Station since 1907. This selection was first distributed to farmers of New York in 1912. Because of the good performance of this strain it was distributed to a number of growers. It yielded very well in the southeastern part of the State in the counties along the Hudson River. It was named Comewell during farmers' week at Cornell University, February 14-19, 1921.

Description.—Early growth erect; plant midseason. Culms midsized to large, fairly stiff, usually glabrous. 80' to 130 centimeters tall. Sheath deep green, somewhat glaucous, glabrous; culm leaves midwide, margins usually glabrous. Peduncle midsized, straight, always well exserted. Panicle equilateral, usually erect, short to midlong, midbroad, ovate; rachis nodes 5 to 7;

³ Accession number of the Office of Cereal Investigations.

⁴ Warburton, C. W., L. C. Burnett, and H. H. Love. Tests of selections from hybrids and commercial varieties of oats. U. S. Dept. Agr. Bul. 99, 25 pp., illus. 1914.

branches short to midlong, usually ascending. Spikelets few to numerous, 2 to 3 flowered; florets slender to midplump. Glumes 19 to 24 millimeters long, 6 to 8 millimeters wide, 8 to 9 veined, light green before maturity. Lower lemma 14 to 17 millimeters long, glabrous, white, dorsal surface only slightly depressed above the awn; basal hairs few to absent; awn present or absent, straight (nontwisted) to twisted and subgeniculate, 10 to 30 millimeters long. Upper lemma 10 to 14 millimeters long, awnless. Second rachilla segment midlong, occasionally slightly hairy.

As an elementary type Comewell is similar to Silvermine. It differs primarily from such varieties as Lincoln, Swedish Select, and the like in being a few days earlier and in having a slightly more



FIG. 2.—Panicles of the Comewell (left) and Empire (right) varieties

slender kernel and fewer, shorter, and less strongly twisted awns. The dorsal surface of the lemma also is less depressed just above the awn. A panicle of Comewell is shown in Figure 2.

EMPIRE

History.—Empire (C. I. No. 1974) is a pure-line selection from a commercial midseason white variety to which the name Big Four has been applied. It was isolated at Cornell University in 1912 and carried the pedigree or plant-breeding No. 115-40. It was first distributed to farmers for trial in 1918 and was named Empire during farmers' week at Cornell University, February 14-19, 1921.

Description.—Plant 90 to 140 centimeters tall. Florets midplump to plump. Lower lemma 14 to 16 millimeters long; awn usually absent. Otherwise similar to Comewell.

Empire is similar to Comewell in time of maturity, height of plant, and shape and size of panicle, as well as in practically all kernel characters. The straw is fairly stiff, but the variety does not stand up so well as some of the others described in this circular. The panicle branches usually are slightly more ascending than in Comewell. The kernel is white and usually midplump. As a rule, only a few of the spikelets bear awns. A panicle of Empire is shown in Figure 2.

ITHACAN

History.—Ithacan (C. I. No. 2141) is a pure-line selection from a variety known as National which has been grown in the experiments at Cornell University. The original selection was made in 1912. Owing to the fact that this strain has slightly outyielded both the Comewell and Empire in experiments throughout the State, it has been recently named and larger quantities of seed made available.

Description.—Same as for Comewell.

This strain differs from Comewell and Empire only in having a more distinctly white kernel and slightly higher yielding ability. A panicle of Ithacan is shown in Figure 3.

STANDWELL

History.—Standwell (C. I. No. 1975) is a pure-line selection from the Lincoln variety. It was selected in 1912 and carried the plant-breeding No. 109-15. This strain was first distributed to farmers in 1918 and was named Standwell, in recognition of its rather stiff straw, during farmers' week at Cornell University, February 14-19, 1921.

Description.—Plant midseason to late; 90 to 150 centimeters tall. Three-flowered spikelets common. Lower lemma 15 to 19 millimeters long, slightly depressed just above the awn; basal hairs usually absent; awn usually present, straight (nontwisted) to twisted, and subgeniculate to geniculate, usually dark at base, 15 to 35 millimeters long. Otherwise similar to Comewell.

Standwell is a few days later and usually grows a little taller than Comewell, Empire, and Ithacan. The kernels are rather long, and the lower floret of each spikelet usually carries an awn. The awns usually are twisted and geniculate and dark at the base, similar to those of the Swedish Select variety. It is a typical strain of Lincoln in most characters and differs primarily from the parent variety in having a stiffer and better straw. A panicle of Standwell is shown in Figure 3.

UPRIGHT

History.—Upright (C. I. No. 2042) is a pure-line selection from a variety locally called American Beauty which has been grown in Jefferson County, N. Y., for many years. The strain was isolated in 1913. It was tentatively designated as Selection 343 and was first distributed to farmers in 1918. Because of its high-yielding power combined with marked ability to resist lodging, this selection was named Upright in 1925.

Description.—Early growth erect; plant midseason to late. Culms large, stiff, usually slightly hairy at the nodes, 90 to 140 centimeters tall. Sheaths deep green, somewhat glaucous before maturity, glabrous. Culm leaves midwide to wide, margins usually glabrous. Peduncle midsized to large, straight, always well exerted. Panicle equilateral, erect, midlong to long, broad, ovate; rachis nodes 5 to 7; branches long, ascending. Spikelets few to numerous, usually 2-flowered; florets slender to midplump. Glumes 22 to 28 millimeters long, 6 to 8 millimeters wide, 9 to 10 veined, light green before maturity, glaucous, noticeably widespread at maturity. Lower lemma white,



FIG. 3.—Panicles of the Ithacan (left) and Standwell (right) varieties

glabrous, slightly glaucous, 17 to 21 millimeters long; basal hairs few to absent; awn usually present, 15 to 30 millimeters long, straight (nontwisted) to twisted, and subgeniculate. Second rachilla segment midlong, glabrous.

Upright has a tall, coarse, very stiff straw and is the latest in maturing of the varieties discussed in this circular. The panicles are large, spreading, and frequently somewhat drooping. The empty glumes at maturity are of an almost pure white with a decided tendency to flare or spread out. In this characteristic Upright is similar to the variety Scottish Chief. The kernels are long and midplump, and most spikelets are awned. The ability of this va-

riety to resist lodging is probably its most outstanding economically desirable character. A panicle of the Upright variety is shown in Figure 4.

CORNELLIAN

History.—Cornellian (C. I. No. 1242) is a pure-line selection from a variety which was received by the department of plant breeding of Cornell University under the name of Canada Cluster.

This original variety was of the Silvermine type with equilateral or spreading panicles. Cornellian probably occurred in this variety as a mechanical mixture. The original selection was made at Cornell University in 1912 and was formerly known as Pedigree or Selection No. 110-36. Like Comewell, it was first distributed to farmers under the selection number and was named during farmers' week at Cornell University, February 14-19, 1921.

Description.—Early growth erect; plant midseason. Culms small to midsized, stiff, glabrous, or slightly hairy at the nodes, 80 to 140 centimeters tall. Sheaths deep green, usually glabrous; culm leaves narrow to midwide, margins occasionally ciliate. Peduncle slender, straight, always well exerted.



FIG. 4.—Panicle of the Upright variety

Panicle equilateral, usually drooping, midsized, short to midlong, midbroad, ovate; rachis nodes 5 to 7; branches midlong, spreading. Spikelets few to numerous; usually 2-flowered; florets slender. Glumes 21 to 26 millimeters long, 5 to 7 millimeters wide; 9 or 10 veined, very light green before maturity. Lower lemma 17 to 19 millimeters long, glabrous, gray to grayish black; basal hairs abundant to few; awn usually absent. Upper lemma 11 to 14 millimeters long, awnless. Second rachilla segment long, glabrous.

The outstanding distinguishing characteristic of Cornellian is its gray lemma, which seldom bears an awn. Under New York conditions the color may vary from a very light gray to almost black.

The kernels are rather slender, but the hull is very thin, thus giving the variety a very high bushel weight. It ripens as a midseason variety and produces tall vigorous plants which usually do not lodge quickly. In the field when fully ripe the Cornelian with its gray lemmas presents a rather distinctive appearance and usually can be readily distinguished from other varieties. Its identity, therefore, is not easily obscured, and as a result no particular difficulty should be experienced in keeping it pure. A panicle of the Cornelian is shown in Figure 5.

COMPARATIVE YIELDS

RESULTS AT ITHACA

A comparison of these different strains as to yield is shown in Table 1. The yields of three commercial varieties also are included, in order to show how the new strains compare with them. These commercial varieties belong to two distinct groups—those with equilateral or branching panicles, represented by Silvermine and Swedish Select, and those with unilateral or one-sided panicles, represented by Mammoth Cluster (Storm King). The yields are given for the years 1918 to 1923, inclusive. The results for 1924 are not included, because a late wet spring made it impossible to sow the seed for all the experiments at the same time, and as a result not all of the yields are comparable for that year.

The results presented in Table 1 show that Cornelian heads the list, with an average acre yield of 58.9 bushels, and Ithacan follows, with an acre yield of 53.7 bushels. The varieties Comewell, Empire, and Standwell are next in order, their yields varying only slightly. The yields of these selections are slightly higher than that of Silvermine. Upright yields less, the strongest point in favor of this variety being its stiff straw. Swedish Select yields less than the new strains, particularly Ithacan and Cornelian. The average acre yield of Swedish Select is 7.3 and 12.5 bushels less than those of

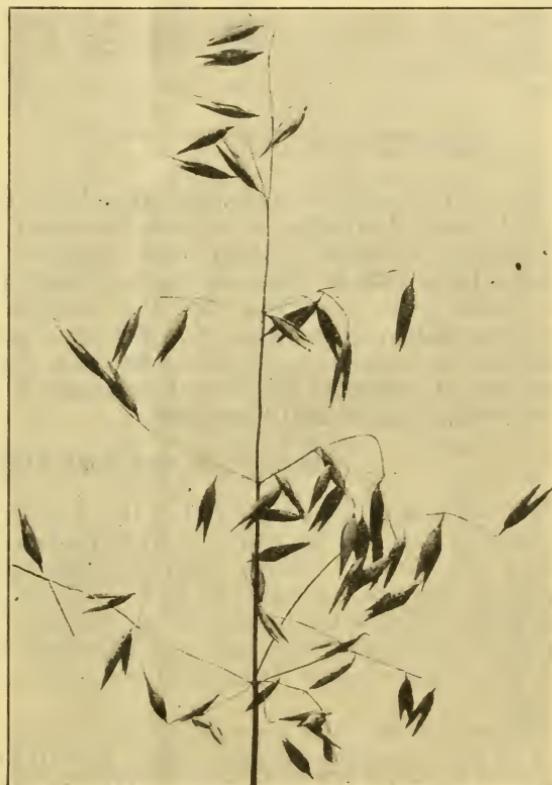


FIG. 5.—Panicle of the Cornelian variety

Ithacan and Cornellian, respectively. Mammoth Cluster, representing the side-oat group, is much inferior to any of the new strains and also to Silvermine and Swedish Select.

TABLE 1.—*Annual and average acre yields of six improved and three commercial oat varieties grown at Ithaca, N. Y., during the 6-year period from 1918 to 1923, inclusive*

Variety	C. I. No. ¹	Acre yield (bushels)						Average
		1918	1919	1920	1921	1922	1923	
Cornellian	1242	65.8	52.4	57.3	63.9	61.4	52.8	58.9
Ithacan	2141	67.8	51.6	48.2	55.0	53.1	46.5	53.7
Comewell	1317	66.2	42.8	47.9	45.5	52.7	51.1	51.0
Empire	1974	58.6	48.4	45.9	50.1	52.7	44.5	50.0
Standwell	1975	53.0	47.4	52.2	52.5	48.4	46.3	50.0
Silvermine ²	1264	54.6	48.2	46.9	52.1	52.3	43.0	49.5
Upright	2042	52.6	46.2	50.2	51.9	42.8	47.6	48.5
Swedish Select ³	1259	58.2	40.6	43.7	43.3	47.0	45.4	46.4
Mammoth Cluster ⁴ (Storm King)	1256	39.4	39.8	43.4	41.3	34.2	37.2	39.2

¹ Accession number of the Office of Cereal Investigations.

² Plant-breeding No. 1571.

³ Plant-breeding No. 1575.

⁴ Plant-breeding No. 2544.

Two varieties which have been introduced from Michigan, College Wonder and Wolverine, selections developed at the Michigan Agricultural Experiment Station, were included in the experiments at Ithaca from 1921 to 1923, inclusive. Their average acre yields for the three years were 45.4 and 43.8 bushels, respectively, whereas the acre yield of Cornellian for the same period was 59.4 bushels. Another variety, O. A. C. 72 (Siberian), also has been tested, and although it averages less than Cornellian it is somewhat ahead of Comewell, Empire, and Standwell.

RESULTS ON NEW YORK FARMS

The six new strains described in this circular also have been tested in various parts of the State of New York to determine their adaptation and yielding power. As previously stated, these experiments on farms have been conducted in 11 counties distributed throughout the State. The annual and average yields of these and three other varieties, Victory, Wolverine, and Mammoth Cluster (Storm King), for the 4-year period from 1921 to 1924, inclusive, are shown in Table 2.

These nine varieties were all grown in each of the four years and in 7 of the 11 counties in each year. Not all of the counties were the same in each of the four years. Of the seven tests conducted in 1924 comparable data were obtained from only four, and these four are used in determining the average yields in 1924.

The average yields for the four years do not show marked variation between the different strains, with the exception of Mammoth Cluster, the side oat, which is much lower in yield than the others. The individual farm yields of Cornellian in 1924 were comparatively much lower than for the other years, with the result that it ranks second in the average. The average for both the first two and the first three years ranks Cornellian first and Ithacan second.

The results show little difference between these two strains in the experiments in the different counties.

TABLE 2.—*Annual average and grand average acre yields obtained from nine oat varieties grown on New York farms in the 4-year period from 1921 to 1924, inclusive*

Variety	C. I. No. ¹	Acre yield (bushels)				
		1921	1922	1923	1924	Average
Ithacan	2141	46.9	53.0	65.8	64.7	57.6
Cornellian	1242	47.7	56.6	63.8	60.4	57.1
Standwell	1975	45.2	49.1	62.5	60.5	54.3
Empire	1974	44.6	51.8	63.8	55.8	54.0
Comewell	1317	44.6	47.6	63.5	58.7	53.6
Victory ²	1279	42.5	49.8	61.0	61.3	53.6
Upright	2042	44.5	47.0	61.9	59.9	53.3
Wolverine	1591	36.9	49.6	66.2	60.6	53.3
Mammoth Cluster (Storm King) ³	1256	37.0	39.9	54.9	47.2	44.7

¹ Accession number of the Office of Cereal Investigations.

² Plant-breeding No. 2286.

³ Plant-breeding No. 2544.

The results of these farm tests do not indicate a great difference between Ithacan and Cornellian, on the one hand, and the other sorts tested, with the exception of the Mammoth Cluster. In a number of places in the State the white-seeded varieties, Comewell, Empire, and Standwell, have been grown in preference to Cornellian. The Victory oat also is grown by some farmers and is giving very good results.

Upright is of value because of its very stiff straw rather than its high yielding ability. On some of the very productive soils on certain dairy farms it is giving satisfaction, as it stands up longer than any other oat that has been included in these experiments.

The reasons for the distribution of some of these strains may be of interest. The first strain distributed to farmers of New York was the Comewell (123-5). This distribution was on the basis of its creditable performance at Ithaca, where its average acre yield for the years 1907 to 1913, inclusive, was 61.7 bushels. It was distributed and found favor in a number of sections.

The demand for improved oats continued, so that in 1916 samples of Empire (115-40) and Standwell (109-15) were distributed under their pedigree numbers. The purpose of this first distribution was to compare these new sorts with local varieties. The selections gave such satisfactory results in many places that the crop was saved for seed, and multiplication thus began.

Cornellian (110-36) also was distributed about the same time, but met with some objection because of its gray color. However, as its cultivation continued it rapidly gained in favor on account of its satisfactory yield. It is now being grown on a rather extensive scale, but in certain localities growers still prefer the white-kerned sorts, such as Comewell, Empire, and Standwell.

The results of observations made in 1924 indicate that about one-fourth of the oat acreage in New York is now sown to these new strains. In some sections one variety is more favored by the growers than another, largely for local reasons. The general results show that in most places Cornellian will outyield the local varieties con-

siderably, and also the white-kernelled strains described in this circular, but owing to the fact that some growers prefer the stiffer strawed or white-kernelled types the other strains are grown.

PERCENTAGE OF CARYOPSIS

One of the most important economic characters of an oat variety is the production of a large percentage of caryopsis, or "meat," in proportion to hull (lemma and palea). This is of particular importance in New York State, where such a large proportion of the crop is fed on the farm. It is of importance also if oats are to be sold, as those that have a high percentage of caryopsis will be of better quality and of greater feeding value for a given weight. There is a great difference between varieties in this respect, some having only 60 per cent of caryopsis, or 60 pounds in 100 pounds of threshed oats, whereas others run as high as 75 per cent. It is very important, then, to consider the percentage of caryopsis when experimenting with different strains of oats. This has been determined for a large number of varieties under experiment during several years. It is not necessary to give these figures for all the experiments. The acre yield, average bushel weight, caryopsis percentage, and acre yield of caryopses for the varieties and strains discussed in this circular are shown in Table 3.

TABLE 3.—*Average data on acre yield, bushel weight, caryopsis percentage, and acre yield of caryopses for nine varieties of oats grown in the experiments at Ithaca, N. Y.*

Variety	C. I. No. ¹	Acre yield, 1921-1923 (bushels)	Bushel weight, 1921-1923 (pounds)	Caryopsis percentage, 1923	Acre yield of caryopses, 1921-1923 (pounds) ²
Cornellian	1242	59.4	32.83	75.0	1,425.6
Ithacan	2141	51.5	29.42	69.3	1,142.1
Comewell	1317	49.8	28.58	70.5	1,123.5
Victory ³	1279	49.6	30.25	69.8	1,107.9
Empire	1974	49.1	30.75	70.6	1,109.3
Standwell	1975	49.1	28.50	70.1	1,101.4
Upright	2042	47.4	29.58	67.5	1,023.8
Swedish Select ⁴	1259	45.2	32.17	70.2	1,015.4
Mammoth Cluster (Storm King) ⁵	1256	37.6	28.83	64.0	770.0

¹ Accession number of the Office of Cereal Investigations.

² Calculated on the basis of 32 pounds to a bushel in each case.

³ Plant-breeding No. 2286.

⁴ Plant-breeding No. 1575.

⁵ Plant-breeding No. 744.

The results show that there is considerable variation in caryopsis percentage and that this does not vary absolutely with bushel weight. It happens that Cornellian has the highest bushel weight as well as the highest caryopsis percentage. The variety that has the next highest bushel weight, Swedish Select, has only 70.2 per cent of caryopsis. Standwell, which has about the same percentage of caryopsis as Swedish Select, has a bushel weight of only 28.5 pounds.

The importance of considering caryopsis percentage is shown by the column giving the pounds of caryopses produced per acre. The acre yields of threshed grain in the several varieties show great differences, and the yields of caryopses show even greater differences. The acre yield of threshed oats for Cornellian is 1,834 pounds.

whereas that for Mammoth Cluster (Storm King) is 1,203 pounds, or 65.6 per cent of the former. When these two are compared as to their acre production of caryopses it is found that Cornellian produces 1,425.6 pounds, whereas Mammoth Cluster produces only 770 pounds, or only 54 per cent of the former. Mammoth Cluster is not only a poor yielder in total grain but even poorer in yield of the most valuable part of the grain. Cornellian produces more

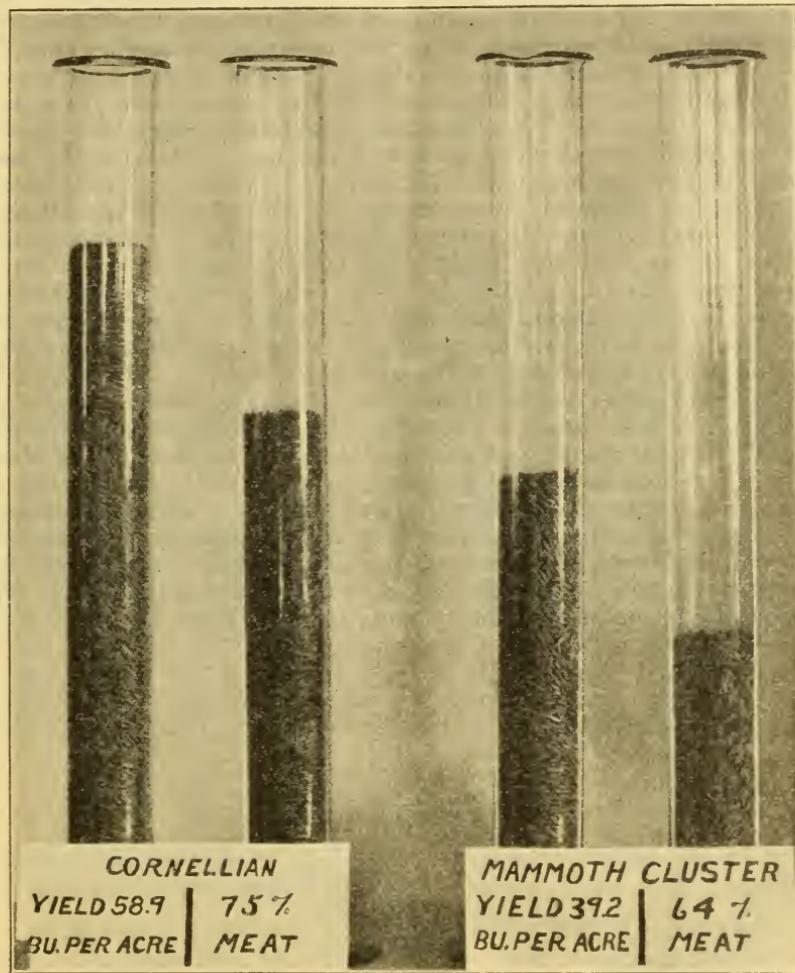


FIG. 6.—Comparative yields of dehulled oat kernels, or caryopses, from Cornellian and Mammoth Cluster

pounds of caryopses per acre than Mammoth Cluster did of threshed oats. The comparative yields of dehulled oat kernels, or caryopses, from these varieties are shown in Figure 6.

It should be pointed out that large seeds do not always indicate a high percentage of caryopsis. Some of the sorts with large seeds have thick lemmas and a low feeding value. The Cornellian is a small-seeded variety, yet it has a high caryopsis percentage, owing

to the fact that the lemma is very thin and all kernels tend to fill well. As a rule, under New York conditions the large-seeded oats do not yield so well or fill so well as the varieties with midsized or small seeds.

SUMMARY

In this circular six new strains of oats developed by the department of plant breeding of Cornell University in cooperation with the Office of Cereal Investigations of the Bureau of Plant Industry, United States Department of Agriculture, are discussed. They are Comewell, Cornellian, Empire, Ithacan, Standwell, and Upright.

During the six-year period from 1918 to 1923, inclusive, in experiments at Ithaca the Cornellian has produced decidedly the highest average yield, exceeding its nearest competitor, the Ithacan, by more than 5 bushels to the acre. The average yields of the Comewell, Empire, and Standwell are comparable with that of the Ithacan. Upright has been slightly outyielded by Silvermine, a standard mid-season variety, but this slight disadvantage in yielding power is more than offset by ability to resist lodging. Mammoth Cluster (Storm King), a late thick-hulled variety with a one-sided panicle, has produced decidedly the lowest yield of all varieties. Cornellian has outyielded it by nearly 20 bushels to the acre.

On New York farms the Ithacan and Cornellian have exceeded the midseason white varieties, Comewell, Empire, Standwell, Upright, and Victory, as a group by about 3 bushels to the acre. The Mammoth Cluster, as at Ithaca, has been markedly inferior in yield.

The proportion of caryopsis to total floret (kernel), or percentage of "meat" to hull, is shown to be a very important character and one well developed in the new variety Cornellian. Owing to the low caryopsis percentage in such side oats as Mammoth Cluster, this type can not be recommended for growing on New York farms.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

July 14, 1925

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<i>Bureau of Plant Industry</i>	WILLIAM A. TAYLOR, <i>Chief</i> .
<i>Office of Cereal Investigations</i>	CARLETON R. BALL, <i>Senior Agronomist in Charge</i> .

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